WIRELESS APPARATUS. By R. L. SMITH-ROSE, D.Sc., Ph.D., A.M.I.E.E.

As on former occasions an excellent display of wireless apparatus was to be found at this year's exhibition, in a variety which covered the whole application of the art from commercial ship and shore communication to the simplest type of broadcast receiver. Various firms showed samples of their manufactured products in the form of the latest types of transmitting and receiving valves, and the miscellaneous components to be found in every wireless receiver. Limitations of space necessitate that this review shall be confined to a few exhibits which commanded attention either from their novelty or from the marked improvement in design and performance which has taken place in recent years.

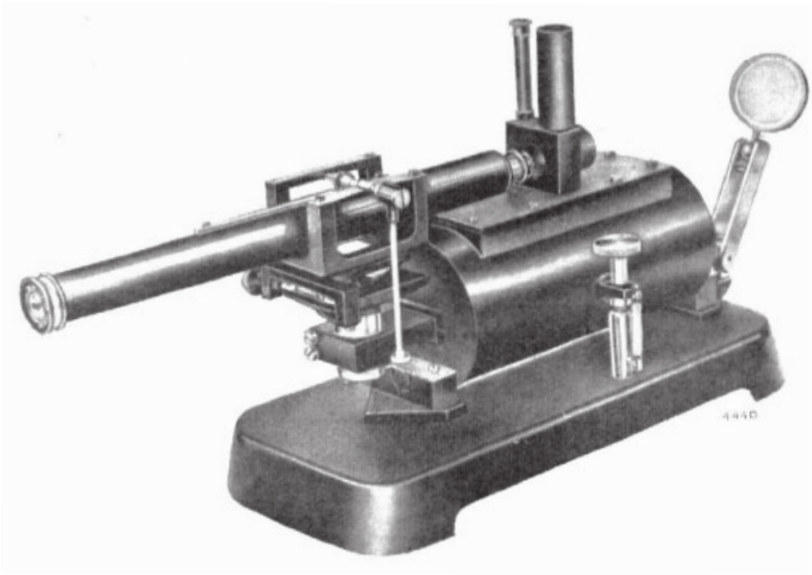

Fig. 1. Mr E. B. Moullin's standard radio-frequency ammeter

Noteworthy among the scientific laboratory type of instrument was the standard radio-frequency ammeter invented by Mr E. B. Moullin and constructed by the Cambridge Instrument Co., Ltd. This ammeter, illustrated in Figs. 1 and 2, is a simplified current balance whose geometrical arrangement is such that the various magnetic and electric fields are capable of exact solution; hence after calibration with direct current the corrections to be applied at very high radio-frequencies can be calculated. As can be seen from the sectional drawings in Fig. 2, the instrument comprises two parallel cylindrical tubes placed symmetrically within a circular screening tube, and its action depends upon measuring the force between the cylinders when carrying in opposite directions the current to

be measured. The particular instrument exhibited gives full-scale deflection for about 10 amperes, with a power expenditure of less than one watt; and the calculated correction from steady current to a radio-frequency of 3×10^7 cycles per second is 6 per cent.

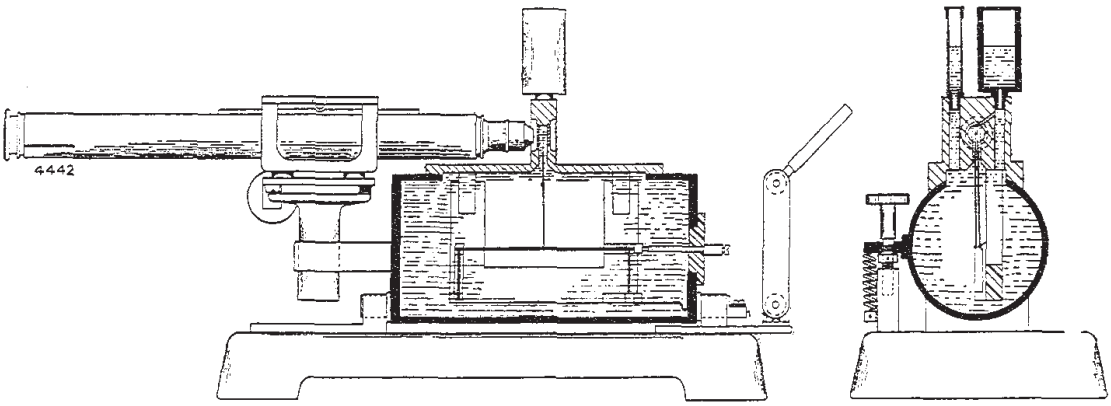

Fig. 2. Illustrating the principle of operation of Moullin's radio-frequency ammeter

For laboratory measurement work at audio-frequencies a convenient source of oscillatory current at a steady voltage is obtained by combining two radio-frequency oscillations to give a beat frequency which is easily and rapidly variable over a range of from 10 to 10,000 cycles per second. Beat frequency oscillation generators of this type were exhibited by Dr D. W. Dye and Mr T. I. Jones of the NATIONAL PHYSICAL LABORATORY, and by the Research Laboratories of the GENERAL ELECTRIC CO., LTD. In the last case the application of this type of oscillator to the study of the performance of loud-speakers was demonstrated.

For the measurement of radio-frequency currents FERRANTI, LTD., exhibited a useful type of self-contained thermal instrument, comprising their standard pattern of direct-current ammeter with the addition of the non-contact type of vacuum thermo-junction previously developed by Elliott Brothers, Ltd. These instruments are made in various maximum ranges of from 25 milli-amperes upwards. The CAMBRIDGE INSTRUMENT CO., LTD., showed an extended range of Moullin's thermionic voltmeters which are now available in various ranges of from 2 to 240 volts (R.M.S.). As is usual at these exhibitions the stands of H. W. SULLIVAN, LTD., and H. TINSLEY & CO. were conspicuous with their display of high-class laboratory apparatus suitable for testing and research work at various frequencies. In this connection the apparatus for making rapid measurements of the capacity and power factor of variable condensers exhibited by Mr R. M. Wilmotte of the NATIONAL PHYSICAL LABORATORY was of great interest.

Turning to wireless receivers, a somewhat elaborate apparatus for the recording of wireless time signals was exhibited by Mr F. M. Colebrook of the NATIONAL PHYSICAL LABORATORY. The receiver comprises four separate units, each contained in a screened box with internal compartments for the mutual screening of stages. The wave-length range of the apparatus is 1500 and 20,000 metres, while in its design special attention has been devoted to the achievement of high selectivity. The overall sensitivity is such as to give satisfactory operation of a relay on time signals transmitted from stations 4000 miles distant.

An interesting wireless direction-finder suitable for installing on ships was exhibited by the RADIO COMMUNICATION CO., LTD. Fig. 3 shows a general view of the direction-finder, which is of the single rotating coil type, suitably screened, and has a wave-length range of from 550 to 1100 metres. The receiving coil is mounted on a substantial deck pedestal for erection over the chart room on board ship, while the scale and control wheel for rotating the frame are carried on an extension below the pedestal and can be fitted over

the chart table if required. Correction of quadrantal error up to 20 degrees is applied automatically, the setting of this correction being adjusted on calibration of the set after installation in the ship (Fig. 4). A portable direction-finder of similar type was also exhibited by Dr R. L. Smith-Rose of the NATIONAL PHYSICAL LABORATORY. This instrument has been designed for research purposes to have an operating range of several hundred miles on wave-lengths of from 40 to 2000 metres, and to give a bearing accuracy of the order of one degree under favourable conditions. An improved pattern of goniometer and receiver for use in the Bellini-Tosi system of direction-finding was also exhibited by MARCONI'S WIRELESS TELEGRAPH CO., LTD.

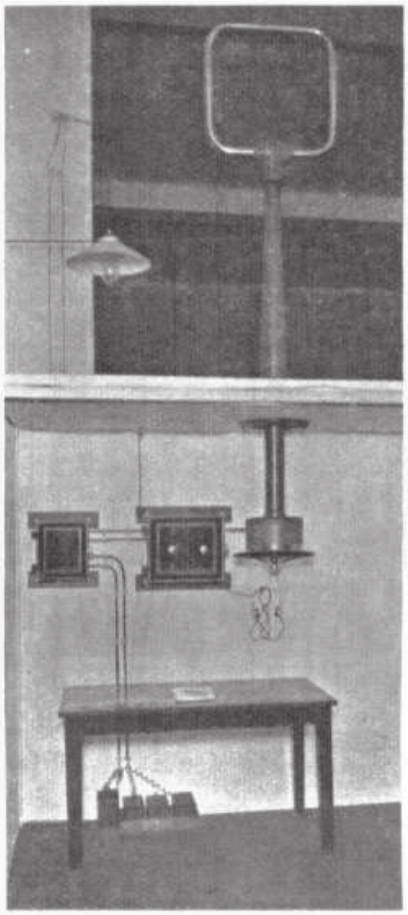

Fig. 3. New radio direction-finder manufactured by the Radio Communication Co., Ltd., for installation on ships

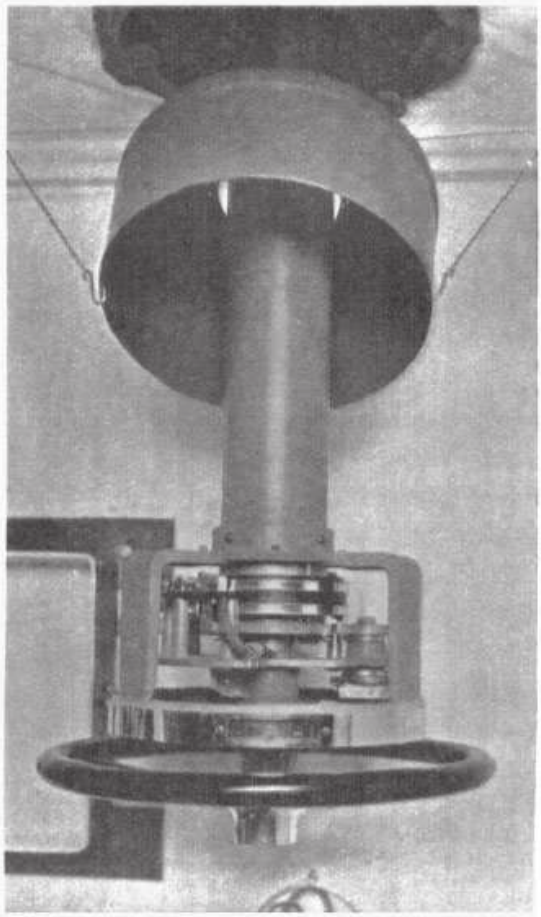

Fig. 4. Showing control wheel and mechanism for correcting quadrantal error

Items of interest on the stands of the manufacturers of wireless valves included a short-wave generator operating at a frequency of 75 million cycles per second (wave-length 4 metres) and employing two MULLARD valves, type DO/20. The M. O. VALVE CO., LTD., also gave demonstrations of an automatic machine for making valve filament supports, and of the use of a radio-frequency eddy-current-heating process to assist in the evacuation of small receiving valves.